

Building a Practical Digital Twin to Address Public Awareness of Sewage Pollution Legislation

NEWEA 2023 Annual Conference & Exhibit | Rajan Ray, Trinnex





Thanks to the Forward-Thinking Team at New Bedford

- Jamie Ponte, Commissioner
- Shawn Syde, City Engineer
- Jim Costa, Superintendent
- Justin Chicca, Deputy Commissioner



Combined Sewer Overflows are a priority water pollution concern for ~700 municipalities across the U.S



https://www.nyc.gov/site/dep/water/combined-sewer-overflows.page



Sewer overflows are challenging on multiple levels from costly fines to impacting public trust

Costly fines

Fines and expensive measures to address fixes Environment & social impacts

From fisheries to community recreational activities **Bad press**

Public confidence and impact on utility brand

314 CMR 16.00: An Act Promoting Awareness of Sewage Pollution in Public Water

- Effective on July 6, 2022
- Permittees must issue public advisory notifications when there is a discharge from their outfalls that consists of untreated sewage and waste.
- Includes combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), and blended wastewater.



CSO Reporting Requirements

- Public Notification 2 hours after discovery of CSOs
- Ongoing updates every 8 hours if event has not ended
- Event completion update 2 hours after event ends
- Submittal on DEP website 18 hours after initial notification



Example: The dreaded 3am event (an overflow lasting < 8 hours)



Example 2: Event lasting greater than 8 hours



Quick diversion: what is a digital twin?

"A digital twin is a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision-making."





Leverage any existing IT infrastructure & data with digital twin to enable cross-functional teams



Utilities can start simple with just one or two data layers to address notification regulation



Where this public advisory notification fits in your digital transformation roadmap



pipeCAST_{TM}

Plug & Play Digital Twin for Sewer Systems





Case Study: City of New Bedford MA

- Population of 100,000
- Earliest sewers date back mid 19th century
- 254 miles of sewer pipe
- 72 CSO Regulators
- 27 CSO Outfalls



New Bedford automated overflow notifications via pipeCAST



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Daily Alerts

- Smart alerts based on pipeCAST calculations
- Immediately find anomalies and trouble spots

Update City Website

- Automatic updates with no human intervention
 - Built-in validation

Send OnSolve emails

- Reverse 911 automated via pipeCAST API
- Multilingual



Report to DEP

- Manual report
- Data from pipeCAST helps populate report

m pipeCAST™

View rainfall, overflow depth, simulated results and forecasts in one view



Easily visualize overflow durations in a single plot for any meter

2 ft **CSO CSO Stops** 1.75 ft Overflows Overflowing @1:55AM @5:15AM 1.5 ft 1.25 ft other flow (mgd) depth (ft) **CSO** < 2 hours No overflow for 2 hours 1 ft Complete @7:15AM 0.75 ft 0.5 ft 0.25 ft 0 ft 5. Jan 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 4

— 003B : overflow level — 003B : observed depth



pipeCAST_{TM}

Meter data sent overflow alarm but pipeCAST corrected and prevented sending a false positive notification



One of the challenges is to be able to identify a maintenance activity vs an actual flooding event



Flexibility in pipeCAST's notification report (include, publish, add comments, etc.)

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		027E	2023-01-13 10:35	2023-01-13 10:45						
		023A	2023-01-12 21:05	2023-01-13 10:50						

Seamless integration with City's website

CITY OF NEW BEDFORD		DESTINATION NEW BEDFORD ECONOMIC DEVELOPMENT COUNCIL			PORT OF NEW BEDFORD		NEW BEDFORD CREATIVE		
RESIDENTS	BUSINESSES	VISITORS	CITY OFFICES	GOVERNMENT	LOCAL LINKS	MAPS	DIRECTIONS	CONTACT	COVID-19
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CITY OF NEW BEDFORD, MASSACHUSETTS > PUBLIC INFRASTRUCTURE > WASTEWATER > NEW BEDFORD CSO REPORT

PUBLIC INFRASTRUCTURE

LOCATED AT:

1105 Shawmut Avenue New Bedford, MA 02746

PHONE NUMBERS

Tel: 508-979-1550

CSO DISCHARGE TABLE

Record is provisional and may be updated									
Receiving Water	Outfall	Outfall Location	Reporting Method	Start Time	End Time	Duration	Volume (million gallons)	Event Rainfall (inches)	
Outer Harbor	018	Cove St. and East Rodney	Sensor	01/12/2023 09:50 PM EST	01/13/2023 11:00 AM EST*	13.17*	3.13*	2.02*	

CSO Notifications, here are your options:



Manual Method

- Manual confirmation using overflow "blocks"
- Review meter data to approximate volume
- Rely on humans to provide updates/notices at all hours of the day



Use mippeCAST

- Leverages existing data and tools
- pipeCAST's cloud platform, data solutions, and cybersecurity
- Plug-and-play with your data so implementation is days not months
- Solid step into a digital twin framework



Build Yourself/DIY

- Data Management
- API connections
- Custom code
- False positives
- Cybersecurity
- Customer Support

Distinguishing methods to validate and streamline notifications via pipeCAST



Use the hydraulic model to identify anomalies and verify overflows



Integrate CMMS and disable a sensor if it is due for maintenance



Built-in validation rules to rule out false positives



Forecast overflows to know what's coming and for proactive maintenance



Takeaways

- Finding a near-term win like automating overflow notification will start your utility on the digital transformation path
- Data and process for the notification regulation is complicated
 - False positives, sensor malfunctions, complex logic, custom integrations
- There are many ancillary benefits for automating overflow notifications
 - Validating equipment performance, cross-collaboration, etc.
- Maximizes existing IT & data investments
 - GIS, sensors, models, CMMS, etc.



Thank again to the fantastic team at New Bedford!

Any questions?

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